

Remarks

Claims 1-3, 5-14, 17-30, 40-42, and 44-52 were pending in this application. Applicants respectfully request reconsideration and reexamination of this application.

Applicants extend their appreciation and thanks to Examiners Fubara and Hartley for the courtesy of an in-person interview on November 25, 2008. Proposed claim amendments were considered as well as arguments to overcome the rejections. The claims have also been amended to maintain claim 1 as the sole independent claim. As a result of these amendments, claims 2, 3, 5, 6, 12-14, 17-30, 40-42, and 44-48 have been cancelled in this Amendment.

As claim 1 has been amended to introduce the term “free polyisocyanate,” claim 10 has been amended to provide antecedent basis for this term.

Claim 1 has been amended to recite the specific polyisocyanates of claim 6. Claim 9 has been amended to delete the limitation “about 3% of the composition is free polyisocyanate.” This limitation is now present in new claim 53, which depends from claim 9. Claim 11 has been amended to recite the specific diisocyanates now present in amended claim 1.

Previously independent claim 51 has been amended to depend from claim 1 and to provide antecedent basis; any redundant limitations have been deleted.

Previously independent claim 52 has been amended to depend from claim 1 and to provide antecedent basis; any redundant limitations have been deleted.

Accordingly, claims 1, 7-11, and 49-53 now remain for examination.

Further details of the claim amendments in response to the rejections are outlined below.

Rejections Under 35 U.S.C. § 102

Claims 1-3, 6-14, 17, 19-30, 40-42 and 44-52 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,241,537 (“Wood”).

Although Applicants respectfully traverse this rejection, for the sole purpose of

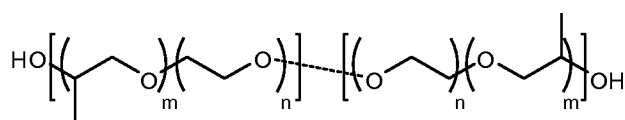
expediting prosecution, Applicants have amended claim 1 as discussed in the Examiner interview. Applicants have amended claim 1 to incorporate the limitation of claim 2 and to delete the limitation “said block copolymer polyol has functionality in the range of 1.5-8.” Claim 1 now recites a block copolymer polyol that is trifunctional. Accordingly, claim 2 has been cancelled.

Claim 1 has also been amended to recite a low molecular weight polyisocyanate “selected from toluene diisocyanate and isophorone diisocyanate,” incorporating the limitation of claim 6. Accordingly, claim 6 has been cancelled.

Claim 1 has also been amended to replace “a low molecular weight free polyisocyanate” with “the low molecular weight polyisocyanate as a free polyisocyanate,” as the term “low molecular weight polyisocyanate” has proper antecedent. Support for “free polyisocyanate” can be found throughout the specification, including the abstract. Accordingly, no new matter has been added.

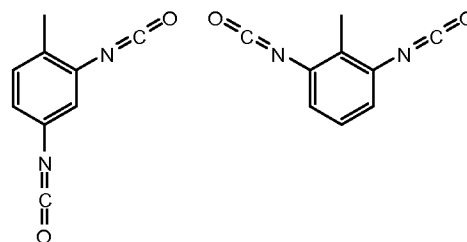
Claim 1 has also been amended to recite a trifunctional block copolymer polyol having a core that initiates and defines the trifunctionality. This structure is presented by way of the product-by-process limitation, “said block copolymer polyol ... is formed from a reaction between a polyethylene/polypropylene oxide diol of between 800 and 5,000 MW, trimethylolpropane, and the low molecular weight polyisocyanate.” Support for this product-by-process reaction can be found in Examples 1-4, where support for the language “polyethylene/polypropylene oxide diol of between 800 and 5,000 MW” can be found at ¶ [0049] of the published application, US 2003/0135238. Accordingly, no new matter has been added.

The product-by-process reaction would necessarily result in a product having urethane linkages near the core. In a first reaction, the polyethylene/polypropylene oxide diol reacts with one of the isocyanate groups of the low molecular weight polyisocyanate to form a block copolymer polyol terminated/endcapped with low molecular weight polyisocyanate.



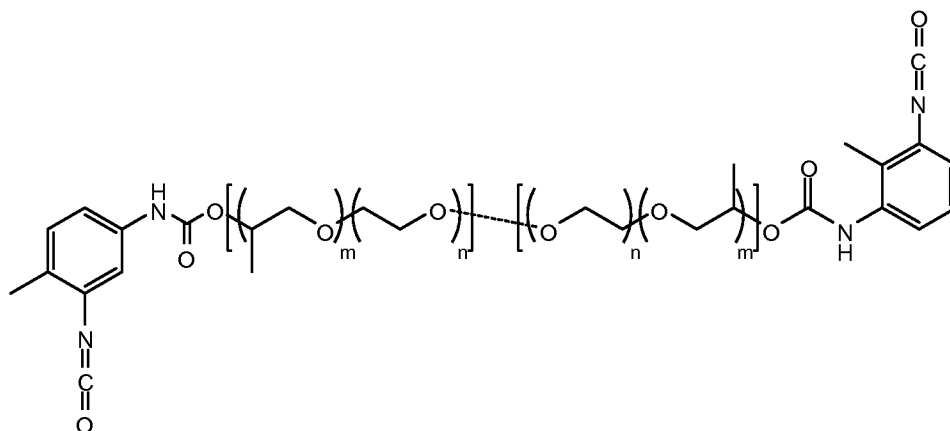
polyethylene/polypropylene oxide diol
(dotted line indicates middle chain of
block copolymer)

+



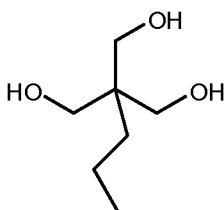
low molecular weight polyisocyanate
(e.g., toluene diisocyanate)

FIRST REACTION

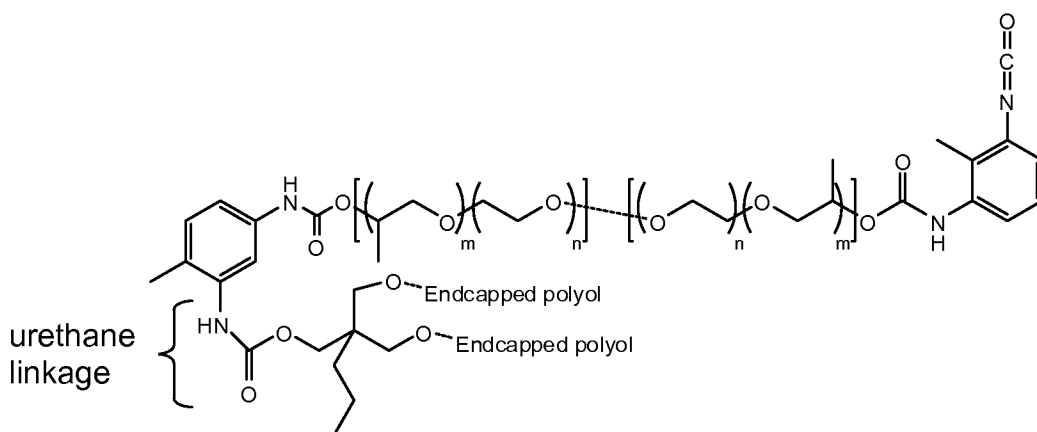


**block copolymer polyol terminated/endcapped with low molecular weight
polyisocyanate**

SECOND REACTION



add **trimethylolpropane**



block copolymer polyol

In the second reaction, the endcapped diol is reacted with trimethylolpropane, which features three hydroxyl groups, each of which can react with the isocyanate group of the endcapped polyol. The resulting product has a carbon center with three branches (trifunctionality), each branch linked to the diol via urethane linkages.

Wood fails to disclose or remotely guide one skilled in the art to a block copolymer polyol formed by reacting a polyethylene/polypropylene oxide diol of between 800 and 5,000 MW with trimethylolpropane and the low molecular weight polyisocyanate, which would form a trifunctional core connected to the polyol via urethane linkages. Instead, Wood is directed to a plant growth media comprising a polyurethane hydrogel. FIGs. 1 and 2 of Wood depict a gel soil plug 1, which holds a growing plant 5. (*Wood* at col. 3, ll. 24-31.) Upon absorbing water, Wood's gel soil plug forms a "cohesive gelled mass." (*Id.* at col. 3, ll. 37-39.) Wood describes this gel soil plug as "advantageous" as it allows the plug to "give up a major portion of its water to the roots 8 of the growing plant 5." (*Id.* at col. 3, ll. 41-44.) Indeed, the plant 5 is implanted in the soil plug 1 initially by combining seeds 13 with a prepolymer 12, followed by the addition of water 17 to form the gel soil plug 1 in situ. (*Id.* at col. 4, ll. 15-18.)

At col. 6, ll. 21-29, Wood shows the chemical structure of a trifunctional polyol. (*Id.* at col. 6, lines 45-60.) It can be seen that Wood teaches the use of a trifunctional core that is linked to the polyol via ether linkages. These ether linkages are distinct from the urethane linkages of Applicants' claims. Moreover, the urethane linkages that

result from the claimed reaction between the diol, trimethylolpropane, and the polyisocyanate impart in a block copolymer polyol a different textural property and hydrophilicity that is readily discernable from Wood's polymer, which contains ether linkages at the core. One skilled in the art would readily appreciate that the urethane linkages near the core of the claimed composition would impart greater hydrophobicity and more rigidity to the resulting polymer than the ether linkages of Wood's polymer. As a result, the claimed composition would not result in a "cohesive gelled mass" when reacted with water, which is required by Wood to allow a plant to grow in situ from seeds. The claimed composition would not have the properties that Wood deems advantageous, such as being capable of giving up a major portion of its water to the plant roots, and having the gelled mass that would have sufficient flexibility/deformity to allow a plant to grow in the media. Thus, it would not benefit the gel soil plug of Wood to have the claimed urethane linkages as it would result in a composition that is less hydrophilic and more rigid in the presence of water.

Applicants respectfully submit that the claimed composition would result in a material that would render the material of Wood inoperable for its purpose. Accordingly, Wood does not render obvious the claimed invention, and Applicants respectfully request withdrawal of this rejection.

Rejection Under 35 U.S.C. § 103

Claims 1-3 and 8 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,624,972 ("Muller"). Applicants respectfully traverse this rejection.

Applicants respectfully submit that Muller does not render obvious the claims for at least the following reasons.

1. Muller does not describe a composition formed from a reaction between a polyethylene/polypropylene oxide diol of between 800 and 5,000 MW, trimethylolpropane, and the low molecular weight polyisocyanate;
2. Muller does not describe a composition comprising a low molecular weight free polyisocyanate in an amount of at least 1% but not more than 5% of

said composition by weight; and

3. Muller does not describe a block copolymer polyol having 10-30% of the monomers derived from propylene oxide monomers.

A more detailed discussion follows.

- 1. Muller does not describe a composition formed from a reaction between a polyethylene/polypropylene oxide diol of between 800 and 5,000 MW, trimethylolpropane, and the low molecular weight polyisocyanate**

Applicants respectfully submit that Muller fails to describe a composition formed from reacting a polyethylene/polypropylene oxide diol of between 800 and 5,000 MW, trimethylolpropane, and the low molecular weight polyisocyanate. As discussed above, the product block copolyol has a trimethylolpropane core linked to the diol via urethane linkages.

Muller only mentions the use of trimethylolpropane in a list of polyester polyols that may be used including “hydroxyl-terminated reaction products of polyhydric alcohols such as ... trimethylolpropane.” (*Muller* at col. 5, ll. 12-17.) This statement leads one skilled in the art to provide ester linkages with trimethylolpropane. There is no discussion or even general guidance to react a trimethylolpropane with the claimed polyisocyanates and the claimed polyethylene/polypropylene oxide diol to form urethane linkages to the trimethylolpropane, which acts as a trifunctional core. Accordingly, Applicants respectfully submit that Muller fails to render obvious the claimed reaction product.

- 2. Muller does not describe a composition comprising a low molecular weight free polyisocyanate in an amount of at least 1% but not more than 5% of said composition by weight**

Applicants respectfully submit that Muller does not disclose a low molecular weight free polyisocyanate in an amount of at least 1% but not more than 5% of said composition by weight. Instead, Muller’s compositions comprise at least 20% or more of a free polyisocyanate.

Muller is directed to the manufacture of polyurethane-based foams, particularly through the use of a prepolymer method. (*Muller* at col. 1, ll. 61-63.) The prepolymer method involves reacting a polyisocyanate with a polyol to form a prepolymer containing free isocyanate. (*Id.* at col. 1, ll. 33-38.) The prepolymer containing the free isocyanate is then reacted with water to form the polymeric foam. (*Id.*) From Muller's numerous descriptions of the manufacturing method, it is evident that in addition to the free polyisocyanate present in the prepolymer, Muller requires combining an additional excess of free polyisocyanate to the polyisocyanate composition.

Applicants have reviewed the entire text of Muller and note the failure of a single instance in which Muller describes a reaction have from 1-5% free polyisocyanate as claimed.

One general statement of the invention is described as the preparation of a flexible foam by reacting 100 parts by weight of a polyisocyanate component with 1-20 parts by weight of an isocyanate-reactive component (at least 40% water). (*Id.* at col. 1, l. 64 to col. 2, l. 10.) The polyisocyanate component, at least one of which is an isocyanate prepolymer, has an NCO content of from 2 to 15%. (*Id.*) This numerical range relates to the relative amount of the total isocyanate component. There is no further disclosure of the relative amounts of the polyisocyanate components, and certainly no guidance to add from 1-5% free polyisocyanate.

Another general statement of invention is described as reacting 100 parts by weight of a polyisocyanate component with 1 to 20 parts of an isocyanate-reactive component (at least 40% water). (*Id.* at col. 2, ll. 11-15.) The polyisocyanate component contains at least two polyisocyanates:

- a low NCO isocyanate-terminated prepolymer, and
- a high NCO polyisocyanate, e.g., tolylene diisocyanate (TDI) or a methylene bridged-polyphenyl polyisocyanate (free polyisocyanate).

(*Id.* at col. 2, ll. 18-23.) Thus, in the most general description, Muller's composition comprises a prepolymer (containing free polyisocyanate) plus an additional free polyisocyanate component.

More specifically, Muller describes the invention as comprising 100 parts by weight of a polyisocyanate component that is to be reacted with 1 to 20 parts of an isocyanate-reactive component (including at least 40% water). The polyisocyanate component comprises at least two diphenylmethane diisocyanate compositions that are described as:

- 60-80% by weight of the polyisocyanate component being reacted residues of isocyanate-reactive species (prepolymer) and
- 20-40% by weight of the polyisocyanate component being methylene-bridged polyphenyl polyisocyanates or reactive residues thereof (free polyisocyanate).

(*Id.* at col. 2, ll. 59-65.) This more specific definition again describes a prepolymer component and a free polyisocyanate. The 60-80% by weight component of “reacted residues of isocyanate-reactive species” is defined in Muller as “prepolymers” obtained by reacting an isocyanate-reactive compound with a stoichiometric excess of MDI. (*Id.* at col. 3, ll. 2-7.) Reacting an isocyanate-reactive compound with a stoichiometric excess of MDI would result in a prepolymer plus an excess of MDI. The 20-40% by weight component of “methylene-bridged polyphenyl polyisocyanates” is defined in Muller as diphenylmethane diisocyanates and oligomers thereof, e.g., crude and polymeric MDI, i.e., free polyisocyanates. (*Id.* at col. 2, l. 66 to col. 3, l. 2.) Again, in addition to the stoichiometric excess of MDI present in the prepolymer composition, Muller requires an additional excess of free polyisocyanates.

Based on these definitions, a substantial portion, i.e., at least 20-40% by weight of the polyisocyanate component is a free polyisocyanate. Moreover, because the prepolymer also contains free polyisocyanate (due to the stoichiometric excess of MDI), this amount of free polyisocyanate in the prepolymer component would be combined with the 20-40% amount of added free polyisocyanate, resulting in greater than 20-40% free polyisocyanate in the composition.

This substantial amount of free polyisocyanate in the generalized descriptions is consistent with the more specific embodiments disclosed in Muller. A preferred reaction system of Muller comprises:

- (A) an isocyanate-terminated prepolymer (low NCO content of 2-15%) obtained by reacting an isocyanate-reactive polymer with an excess of diphenylmethane diisocyanate (prepolymer + free polyisocyanate),
- (B) a diphenylmethane diisocyanate composition (high NCA content of at least 20%) (free polyisocyanate)

(*Id.* at col. 7, l. 64 to col. 8, l. 16.) Muller provides that the total amount of components (A) and (B) equal 20-40% free polyisocyanates. (*Id.*) This composition of (A) and (B) components is then reacted component (C), the an isocyanate-reactive component containing at least 40% water by weight.

Muller's "most preferred" composition comprises:

- (A) an isocyanate-terminated prepolymer (low NCO content of 2-15%) obtained by reacting a polypropylene-polyethylene oxide polyol with a stoichiometric excess of diphenylmethane diisocyanate,
- (B) a diphenylmethane diisocyanate or a TDI composition (high NCO content of at least 20%).

(*Id.* at col. 8, ll. 17-37.) As above, the components (A) and (B) total contain 20-40% free polyisocyanates.

The Examples of Muller provide specific amounts of polyisocyanate components that are consistent with these disclosed ranges. Muller's Examples 1-6 describe compositions for the preparation of flexible foams. The ingredients for Examples 1-6 are defined under the "Glossary" section. (*Id.* at col. 9, l. 45 to col. 10, l. 23.) One skilled in the art would readily appreciate that the components of the Glossary section are not the actual foam compositions but rather the components or ingredients that are used to form Muller's polymeric foams. Among these components or ingredients are various polyisocyanate components, whether free or in prepolymer form. For example, MDI Polyisocyanates A, D, E, and F are the prepolymers, which Muller describes as being prepared with an excess of polyisocyanate. (*Id.* at col. 3, ll. 2-7.) The other components MDI Polyisocyanate B, C, G, and Suprasec DNR are defined by Muller as free polyisocyanates.

In each of Examples 1-6, Muller describes the compositional makeup prior to reacting with water (or the isocyanate-reactive component):

Example No.	Prepolymer	Free Polyisocyanate
1	MDI-A = 80%	MDI-B + MDI-C = 20%
2	MDI-A = 90%	MDI-B = 10%
3	MDI-D = 90%	MDI-C = 10%
4	MDI-E = 90%	Suprasec DNR = 10%
5	MDI-F = 90%	Suprasec DNR = 10%
6	MDI-A = 90%	MDI-G = 10%

As indicated in the table above, each composition contains at least 10% of added free polyisocyanate. In combination with the added free polyisocyanate, the prepolymers contain further free polyisocyanate as they were prepared with an excess of polyisocyanate.

Muller consistently discloses the use of a large excess of free polyisocyanate in a composition comprising a polyisocyanate prepolymer. In contrast, claims 1-3 and 8 recite a smaller amount of free polyisocyanate, i.e., at least 1% but no more than 5% of the composition. There is no indication from Muller of the use of such small amounts of free polyisocyanate as claimed. For at least this reason, Applicants respectfully submit that Muller fails to teach or disclose the claimed amount of free polyisocyanate.

3. Muller does not describe a block copolymer polyol having 10-30% of the monomers derived from propylene oxide monomers

Applicants respectfully submit that Muller fails to describe a block copolymer polyol having 10-30% of the monomers derived from propylene oxide monomers. Instead, for block copolymers, Muller describes copolyols having a majority (greater than 50%) of propylene oxide monomers.

In describing the amounts of ethylene oxide in the copolymer, Muller lists the amounts for random copolymers, block copolymers, and “random/block copolymers.” (*Muller* at col. 4, l. 67 to col. 5, l. 5.) The amounts of ethylene oxide for each copolymer

type, and the corresponding amounts of propylene oxide are tabulated below.

Copolymer Type	% ethylene oxide	% propylene oxide
random copolymers	10-80%	20-90%
block copolymers	2-30% ethylene oxide	70-98%
random/block copolymers	up to 50%	greater than 50%

From this disclosure, Muller provides an explicit teaching of the amounts of ethylene oxide (and thus, propylene oxide) depending on the block nature of the polymer. One of ordinary skill in the art can readily appreciate a trend from Muller. In a random copolymer, a greater variation of ethylene oxide (and thus, propylene oxide) amounts can be incorporated into the polymer. At the other extreme, only up to 30% ethylene oxide can be incorporated in a block copolymer, leaving 70-98% of the blocks formed from polyethylene oxide monomers. The random block copolymer can have an ethylene oxide content ranging up to 50%, or a propylene oxide content of greater than 50%, which is a value intermediate that of the random copolymers and block copolymers.

The specific examples of Muller fall within these ranges. Each of the Examples 1-6 contain at least one of the prepolymers MDI Polyisocyanate A, D, E, or F. “MDI Polyisocyanate A” (col. 9, ll. 45-48) is defined in the Glossary as a prepolymer formed from “750 parts of an ethylene oxide tipped polyoxypropylene.” (*Id.* at col. 9, ll. 45-48.) Alternatively stated, this polymer is a polyoxypropylene tipped or capped with an ethylene oxide. This description indicates essentially a homopolymer of polyoxypropylene except for the capping ethylene oxide unit. As a result, this prepolymer would necessarily include a very high proportion of propylene oxide save for the ethylene oxide at the tip of the polymer. MDI Polyisocyanate A would not fall within the scope of the claims as it has a propylene oxide content well above the claimed upper limit of 30%.

“MDI Polyisocyanate D” (col. 9, ll. 55-59) is a prepolymer having the “above mentioned polyether triol,” i.e., the same polyether triol as MDI Polyisocyanate A, which

contains a very high propylene oxide content well above the claimed upper limit of 30%.

“MDI Polyisocyanate E” (col. 9, l. 60 to col. 10, l. 3) is a prepolymer having an “overall ethylene oxide content” of about 27% relative to the total amount of oxyalkylene residues.” This prepolymer provides about 73% propylene oxide, more than double the amount of the claimed upper limit of 30%.

“MDI Polyisocyanate F” (col. 10, ll. 4-9) is a prepolymer having a polypropylene oxide/ethylene oxide with an ethylene oxide content of 10.9% “by weight as tipping,” i.e., the ethylene oxide tips the polymer ends. Again, this polymer is very high in propylene oxide content and is well above the claimed upper limit of 30%.

Examples 1-6 are polyisocyanate compositions formed by combining the various prepolymer polyisocyanates (+ excess polyisocyanate) with free polyisocyanate. Because each of the polyalkylene-containing polymers contain a very high proportion of propylene oxide (well above 30%), the combination of these polymers would necessarily result in a product having a very high propylene oxide content with respect to the polyalkylene polymer.

Throughout the specification, Muller consistently describes polyethers having a high propylene oxide content where the polyether is a block copolymer. Accordingly, Applicants respectfully submit that Muller fails disclose the claimed copolymer structure.

Applicants respectfully submit that Muller fails to disclose or suggest each and every limitation of the claimed invention, e.g., the amount of free polyisocyanate and the amount of propylene oxide in the copolymer copolyol. Accordingly, Applicants respectfully request withdrawal of this rejection.

Reconsideration

It is believed that all claims of the present application are now in condition for allowance.

Reconsideration of this application is respectfully requested. If the Examiner believes that a teleconference would expedite prosecution of the present application the Examiner is invited to call the Applicant's undersigned attorney at the Examiner's

earliest convenience.

Any amendments or cancellation or submissions with respect to the claims herein is made without prejudice and is not an admission that said canceled or amended or otherwise affected subject matter is not patentable. Applicant reserves the right to pursue canceled or amended subject matter in one or more continuation, divisional or continuation-in-part applications.

To the extent that Applicant has not addressed one or more assertions of the Examiner because the foregoing response is sufficient, this is not an admission by Applicant as to the accuracy of such assertions.

Please grant any extensions of time required to enter this response and charge any fees in addition to fees submitted herewith that may be required to enter/allow this response and any accompanying papers to our deposit account 02-3038 and credit any overpayments thereto.

Respectfully submitted,

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